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U S NAVAL PROVING GROUND  
DAHLGREN, VIRGINIA

REPORT NO 1147

WARHEADS FOR AIR TARGET GUIDED MISSILES  
TESTING OF

64th Partial Report

FRAGMENTATION TEST OF  
ROD-EXPELLING WARHEAD NO 143

FINAL Report

Copy No 11

Task

Assignment NPG Re3f 607 1-53

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Fragmentation Test of Rod-expelling Warhead No. 143  
-----PART ASYNOPSIS

1. This test was conducted to determine the effect of cork liners on the fragment mass distribution of 4.74 diameter rod-expelling warhead Nos. 143-1 and 143-2, Composition C-3 loaded. These warheads are internally slotted to produce 26 rod-like fragments, each weighing 350 grams and 12" in length.

2. a. Warhead No. 143-2, which employed a full length 1/16" thick cork liner, produced 26 rod-like fragments averaging 320 grams each. Twenty-four were full length, one was 11-3/4", and one was 10". The full length cork liner also reduced the amount of chaff obtained in this model warhead. Warhead No. 143-1, which employed a 3/16" thick cork liner only 8" long, was not as successful.

b. In the warhead model tested, the use of the 1/16" thick full length cork liner did prevent end loss on practically all of the rod-like fragments.

Fragmentation Test of Rod-expelling Warhead No. 143  
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Fragmentation Test of Rod-expelling Warhead No. 143  
-----PART BINTRODUCTION

## 1. AUTHORITY:

This test was authorized by reference (a) and conducted under Task Assignment NPG-Ro3f-607-1-53, reference (b).

## 2. REFERENCES:

- a. NOL Conf Work Request WG/33/53 of 21 January 1953
- b. BUORD Conf ltr NP9-Ro3f-RKJ:gg Serial 42699 of 29 July 1952
- c. NPG Conf Report No. 1001 of 22 July 1952
- d. NPG Conf Report No. 972 of 5 May 1952

## 3. BACKGROUND:

a. Reference (b) authorized the Naval Ordnance Laboratory to work directly with the Naval Proving Ground in the development and testing of guided missile warheads.

b. In reference (a) the Naval Ordnance Laboratory requested that rod-expelling warhead Nos. 143-1 and 143-2 be tested for mass distribution data. These warheads contained cork liners. Similar warheads without liners, Nos. 134 and 138, were tested and reported in references (c) and (d). Warhead No. 143 was designed to produce 26 rod-like fragments, 12" long.

## 4. OBJECT OF TEST:

This test was conducted to determine the effect of cork liners on the fragment mass distribution of 4 7/8" diameter rod-expelling warheads Nos. 143-1 and 143-2, Composition C-3 loaded. These warheads are internally slotted to produce 26 rod-like fragments, each weighing 350 grams and 12" in length.

## 5. PERIOD OF TEST:

- |                                     |                 |
|-------------------------------------|-----------------|
| a. Date Project letter              | 21 January 1953 |
| b. Date Necessary Material Received | 27 January 1953 |
| c. Date Commenced Test              | 31 March 1953   |
| d. Date Completed Test              | 16 April 1953   |

Fragmentation Test of Rod-expelling Warhead No. 143  
-----PART CDETAILS OF TEST

## 6. DESCRIPTION OF ITEM UNDER TEST:

a. Warheads Nos. 143-1 and 143-2, Figures 1 and 2, were 4.74 in diameter and 12.0 long with a uniform wall thickness of 0.50. Each warhead had 26 full length internal slots cut to a depth of 0.40. One end of each warhead had a 1/8" thick steel end plate, Figure 3, held in place by four (4) screws.

b. Warhead 143-1 had a cork liner 3/16" thick and 8.00 long covering the middle inner surface of the case, leaving 2.00 of inner case surface on either end uncovered.

c. Warhead 143-2 had a cork liner 1/16" thick and 12.00 long covering the entire inner surface of the case.

## 7. PROCEDURE:

Each warhead was detonated in a cane fiberboard box surrounded by sawdust in the Fragmentation Chamber. The fragments were collected in the sawdust and separated using a 1/4" mesh screen and a magnetic separator.

## 8. RESULTS AND DISCUSSION:

a. Detailed mass distribution data, shown in Figures 4 and 5, are summarized as follows:

Warhead No.	Average wt. of rods greater than 10" in length (grams)	No. of rods in length groups		
		12"	10"-12"	7"-10"
143-1	309	17	9	0
143-2	320	24	2	0
*134	331	24	0	0
*138	292	10	11	3

\*References (c) and (d).

Warheads 134 and 138 were 4-3/8" in diameter and designed to produce 24 rods, each 12" long. No. 134 had a tapered case whose thickness decreased toward both ends, while No. 138 had a uniform case thickness.

Fragmentation Test of Rod-expelling Warhead No. 143  
-----

b. The 1/16" full length cork liner appeared to be superior to the 3/16" thick 8" long cork liner in: (1) preventing end losses up to 2", and (2) reducing the amount of chaff in Warhead No. 143. Only two of the 26 rods produced by No. 143-2 lost end pieces.

c. Both the tapered case, No. 134, and the uniform case with full length cork liner, No. 143-2, were satisfactory. They produced full length rod-like fragments. The cork liner would appear to be preferable in manufacture to the tapered case.

PART DCONCLUSIONS

9. a. Warhead No. 143-2, which employed a full length 1/16" thick cork liner, produced 26 rod-like fragments averaging 320 grams each. Twenty-four were full length, and the other two 11-3/4" and 10" in length respectively. The full length cork liner also reduced the amount of chaff obtained in this model warhead. Warhead No. 143-1, which employed a 3/16" thick cork liner only 8" long, was not as successful.

b. In the warhead model tested, the use of the 1/16" thick full length cork liner did prevent end loss on practically all of the rod-like fragments.

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Fragmentation Test of Rod-expelling Warhead No. 143  
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The tests upon which this report is based were conducted by:

W. WRIGHT, ENS USNR-R, Fragmentation Firing Officer  
Fragmentation Division  
Terminal Ballistics Department

This report was prepared by:

J. GORMAN, ENS USNR-R, Fragmentation Firing Officer  
Fragmentation Division  
Terminal Ballistics Department

This report was reviewed by:

V. PHILIPCHUK, Fragmentation Battery Officer  
Fragmentation Division  
Terminal Ballistics Department

R. H. LYDDANE, Director of Research  
Terminal Ballistics Department

W. B. ROBERTSON, Lieutenant Commander, USN  
Terminal Ballistics Officer  
Terminal Ballistics Department

C. C. BRAMBLE, Director of Research, Ordnance Group

APPROVED: J. A. EDWARDS, Acting  
Captain, USN  
Commander, Naval Proving Ground



E. A. RUCKNER  
Captain, USN  
Ordnance Officer  
By direction

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NPG REPORT NO. 1147

U. S. NAVAL PROVING GROUND  
DAHLGREN, VIRGINIA

Sixty-fourth Partial Report

on

Warheads for Air Target Guided Missiles,  
Testing of

- - - - -

Final Report

on

Fragmentation Test of  
Rod-expelling Warhead No. 143

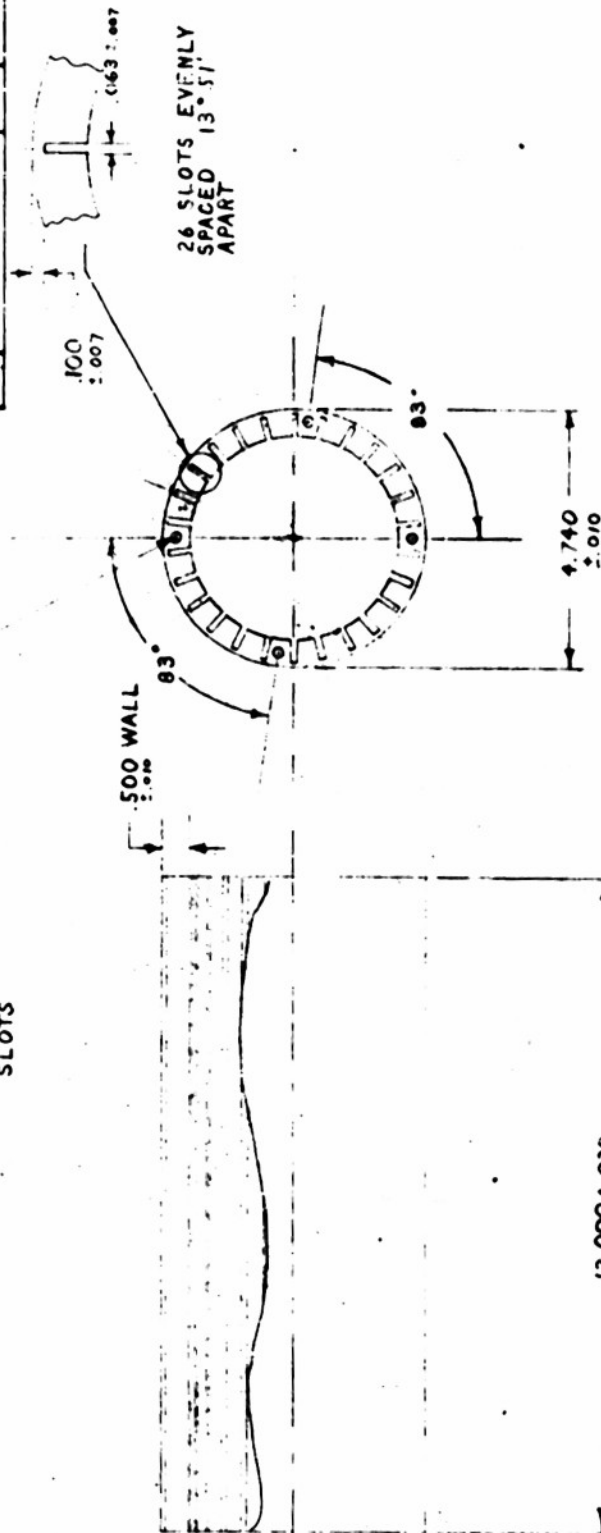
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Date:

JUN 26 1953

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NO 8-32 NC-2 DRILLED & TAPPED TO  
 .563 DEEP. 4 HOLES LOCATED ON  
 4.24 DIA. HALFWAY BETWEEN  
 SLOTS



REVISIONS		
BY	DESCRIPTION	DATE

THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE  
 NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE  
 MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C.  
 SECTION 793 AND 794, AND THE TRANSMISSION OR THE  
 REVELATION OF ITS CONTENTS IN ANY MANNER TO AN  
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 DRAWN BY: 1177809  
 CHECKED BY: 1177809  
 APPROVED BY: 1177809  
 U.S. NAVAL ORDNANCE LABORATORY  
 WHITE OAK, MARYLAND  
 SHIPPER'S DRAWING NO.

TRIAL WARHEAD  
 143

APPROVED		10	
DESIGNED BY	1177809	CHECKED BY	1177809
DRAWN BY	1177809	APPROVED BY	1177809
DATE	11/7/59	SCALE	1/2
UNIT WT.		ASSEMBLY NO.	
APPLICATION			

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Approved 1953

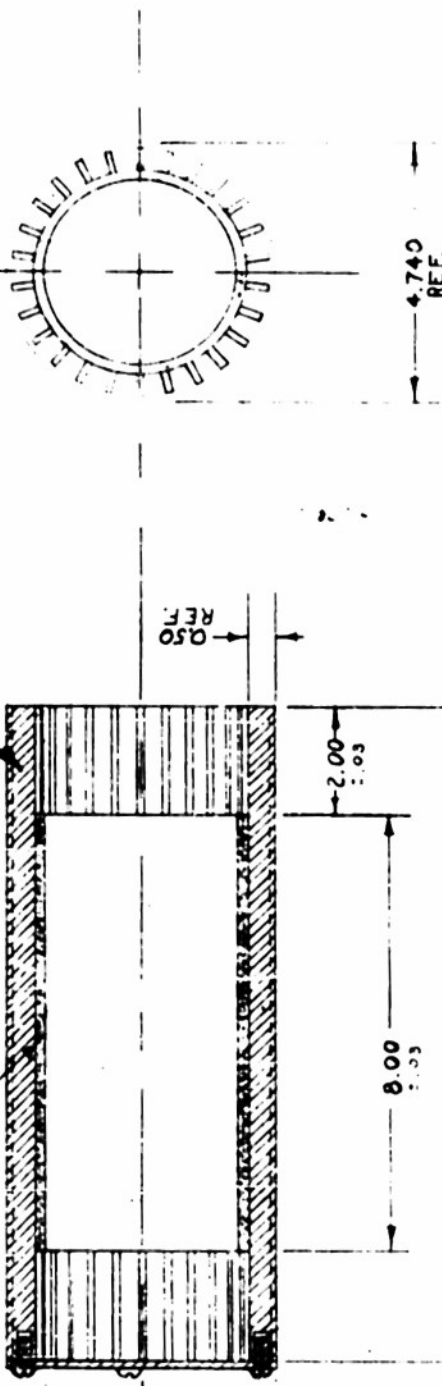
303D Drawing 1183626, Not Exceeding Warhead No. 143-1

Figure 2

1183626

REVISIONS		
SYM	DESCRIPTION	DATE

CORK LINER 3/16 THICK DR. 1177209



THIS DOCUMENT CONTAINS INFORMATION UPDATING THE  
NAVY'S RECORD OF THE DESIGN OF THE WARHEAD ASSEMBLY  
SECTION 791 AND 794 THE TRANSMISSION OF THE  
REVELATION OF ITS CONTENTS IN ANY FORM TO AN  
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WARHEAD 143-1  
ASSEMBLY

NAVY'S RECORD  
NAVAL ORDNANCE LABORATORY  
NAVY'S AND  
NAVY'S AND  
NAVY'S AND

BUOARD DRAWING NO  
1183626

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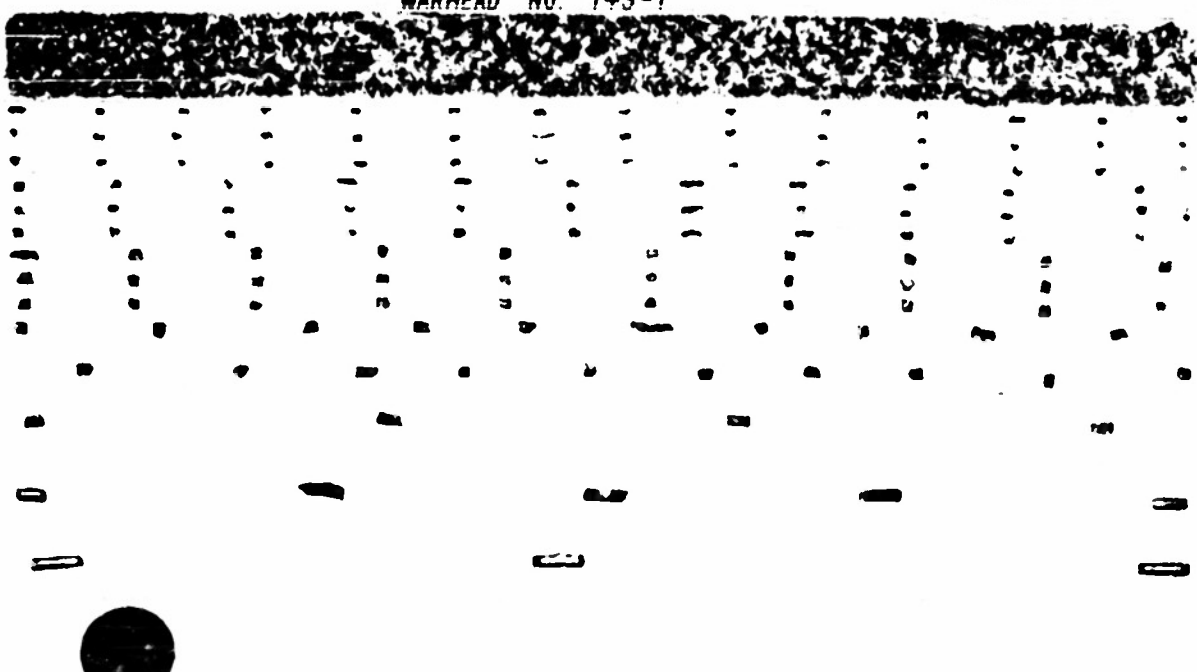
118272

FRAG NO. 1730

WARHEAD NO. 143-1

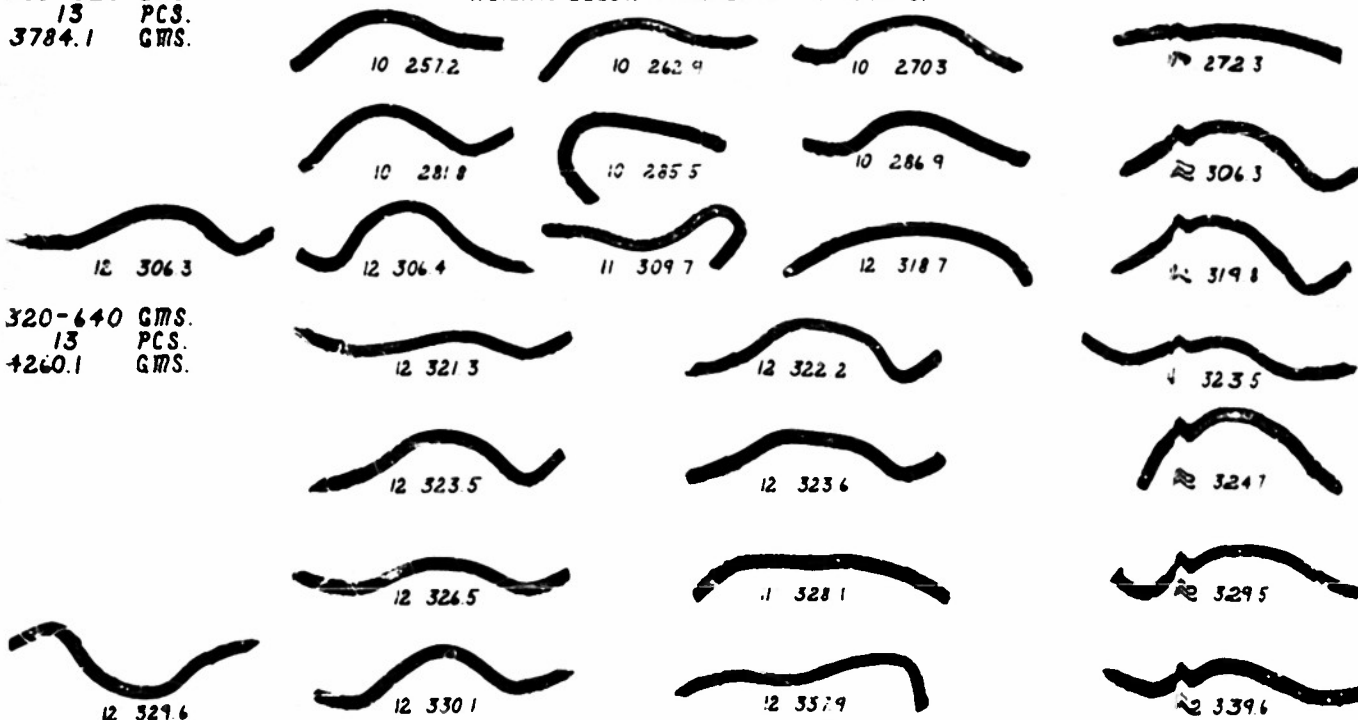
N.P.9 NO. 63026

0 - 1/2 GMS.  
392 PLS.  
GMS.  
1/4 - 1/2 GMS.  
42 PCS.  
37 GMS.  
1/4 - 2 1/2 GMS.  
34 PCS.  
53 GMS.  
2 1/2 - 5 GMS.  
29 PCS.  
107 GMS.  
5 - 10 GMS.  
20 PCS.  
125 GMS.  
10 - 20 GMS.  
4 PCS.  
44 GMS.  
20 - 40 GMS.  
5 PCS.  
162 GMS.  
40 - 80 GMS.  
3 PCS.  
150 GMS.  
80 - 160 GMS.  
1 PCS.  
151 GMS.



160-320 GMS.  
13 PCS.  
3784.1 GMS.

WEIGHTS BELOW FRAGMENTS IN GRAMS.



SCALE 1"

AP9-63026

Mass distribution for Warhead No. 143-1.  
Figure 4

FRAG NO. 1731

WARHEAD NO. 143-2

N.P.9 NO. 63040

0 - 5/8 GMS.  
PCS.  
203 GMS.

5/8 - 1 1/4 GMS.  
14 PCS.  
12 GMS.

1 1/4 - 2 1/2 GMS.  
26 PCS.  
50 GMS.

2 1/2 - 5 GMS.  
32 PCS.  
108 GMS.

5 - 10 GMS.  
22 PCS.  
151 GMS.

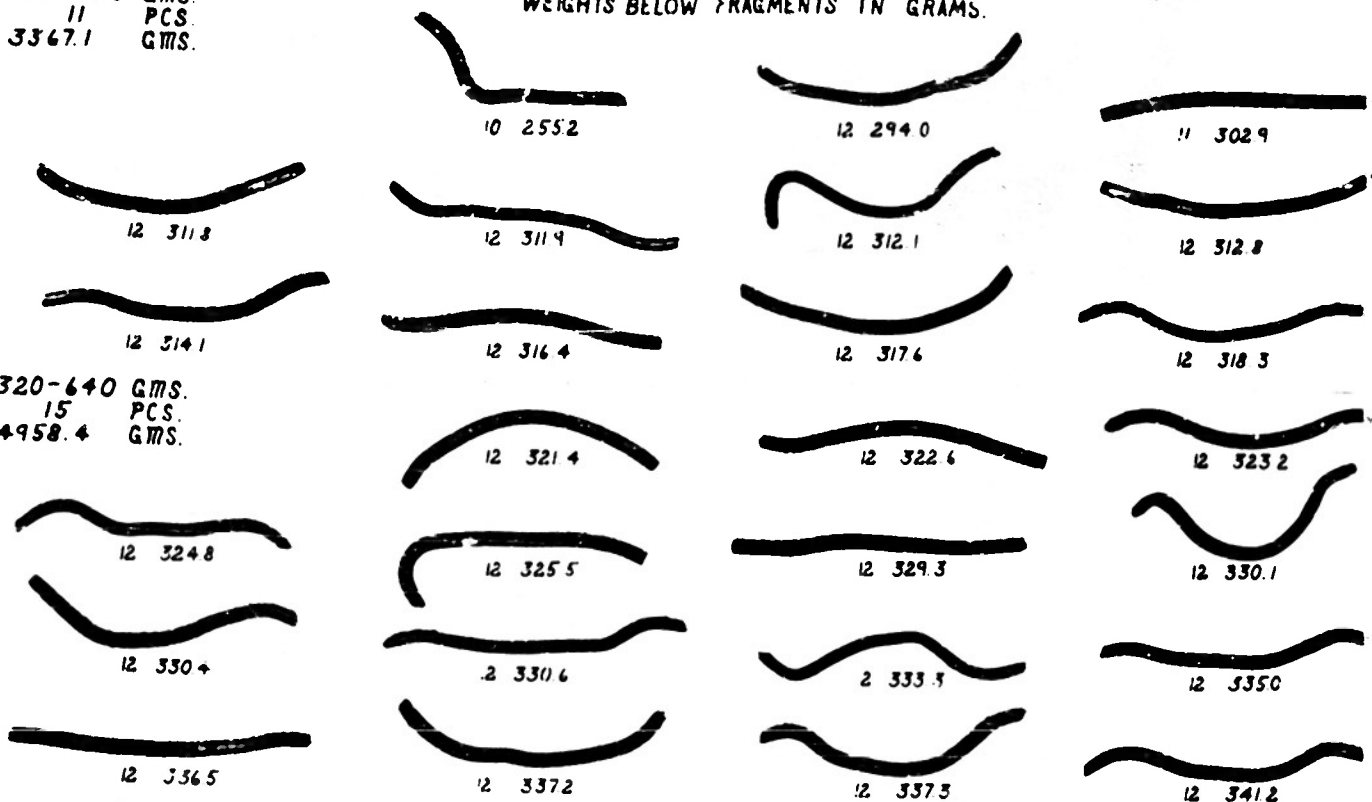
10 - 20 GMS.  
5 PCS.  
61 GMS.

40 - 80 GMS.  
1 PCS.  
42 GMS.

80 - 160 GMS.  
1 PCS.  
132 GMS.

160 - 320 GMS.  
11 PCS.  
3367.1 GMS.

WEIGHTS BELOW FRAGMENTS IN GRAMS.



SCALE 1"

NP9-63040

4 April 1953  
Mass distribution for Warhead No. 143-2.  
Figure

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